

**COOPER RIVER RICE FIELDS: LANDOWNER
ATTITUDES AND PERCEPTIONS TOWARD CHANGE**

by

Edward G. Oswald

Date: 4 May 1997 .

Approved:


Dr. Daniel Richter, Advisor

Dr. Norm Christiansen, Dean,
Nicholas School of the Environment

Master's Project submitted in partial fulfillment of the
requirements for the Master of Environmental Management
degree in the
Nicholas School of the Environment
of Duke University

1997

COOPER RIVER RICE FIELDS: LANDOWNER ATTITUDES AND PERCEPTIONS TOWARD CHANGE

Edward Oswald
Master's Project
Nicholas School of the Environment
Duke University
Durham, NC

Abstract: Rice field landowners along the Cooper River, South Carolina were surveyed to determine management practices, attitudes toward agency regulation, and receptiveness of a basin-wide cooperative management plan. Of twenty-six landowners identified, twenty were surveyed. Results will help area land managers and landowners determine management objectives for the river in the face of rapidly changing environmental conditions. In 1985, the United States Army Corps of Engineers re-diverted water, formally flowing in the Cooper River, to the Santee River, SC. Lowered water levels and decreased flow rates have possibly increased the rate of plant succession occurring in the abandoned rice fields of the Cooper River. Results of the survey show landowners are dissatisfied with current situations and are willing to work with land managers in an attempt to bring more attention to the Cooper River and to develop a basin-wide management plan that would incorporate the rights of the public and the private sector.

Key words: Cooper River, rice fields, impoundments, landowner survey, river management, flow re-diversion, South Carolina.

INTRODUCTION

The Cooper River is a coastal plains river extending from Pinopolis Dam on the West Branch and the town of Huger on the East Branch to Charleston, South Carolina (Figure 1). The river is tidally influenced throughout its entire length and lies within two counties, Charleston and Berkeley. Man's influence on the Cooper River over the last three hundred years has made it an even more dynamic system and a unique case study. In the late 1600's and throughout the 1700's, area planters converted thousands of acres of river-adjacent swamp forest to open water rice fields for the sole purpose of growing rice. Most recently, though, water flow in the Cooper River has been manipulated twice. First, in 1942, the US Army Corps of Engineers diverted water from the Santee River to the Cooper River. Then in

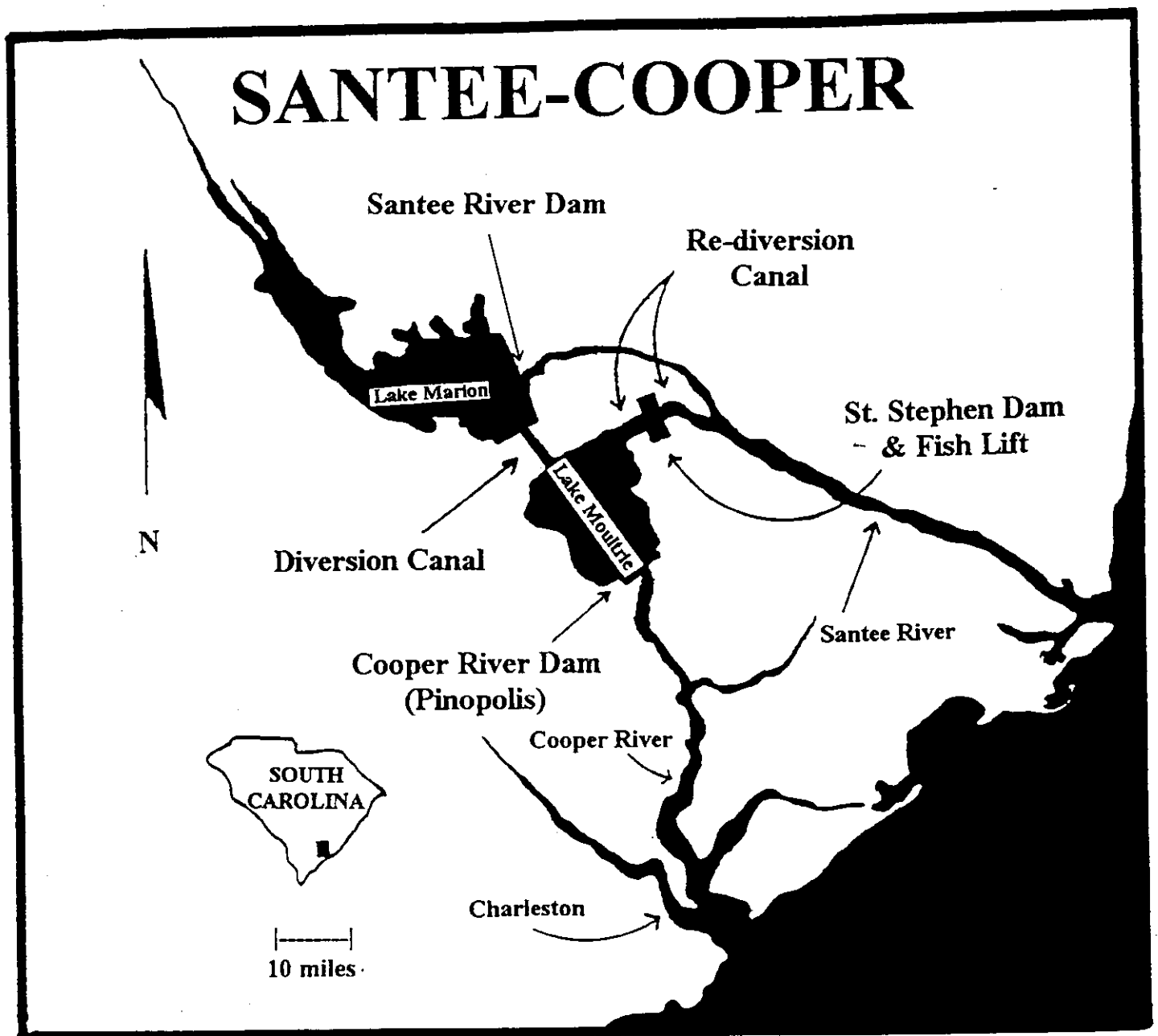


Figure 1 Map adopted from USACE's publication: Santee Cooper Anadromous Fish, Fish Passage and Restoration. Map shows the location of the dams and associated canals and lakes of the diversion and re-diversion projects of 1942 and 1985, respectively.

1985, the US Army Corps of Engineers' Re-Diversion Project, designed to correct the problems caused by the 1942 diversion project, re-diverted the water from the Cooper River back to the Santee River (US Army Corps of Engineers' publication: Santee Cooper Anadromous Fish, Fish Passage and Restoration; personal communication, Sarah Brown USACE, Hydrolic Engineer, 1997)(Figure 1).

The re-diversion project lowered the Cooper River's water level an average of fifteen centimeters and has altered the terrestrial plant succession occurring on the river's terraces and adjacent rice fields. Successional changes taking decades in other comparable Lowcountry river systems may be occurring faster in the Cooper River because decreased flow has enabled vegetation to establish in areas where previously deeper waters had prevented growth. Due to these rapid changes, important ecological, recreational, and economic functions and values may be lost (Kelley et al. 1995).

Of particular interest are the abandoned rice fields, where the changes have been remarkably noticeable. Long cultivated for rice production, the rice fields were originally large expanses of shallow water bounded entirely by dikes¹ which enabled the area planters to control the water level within the fields for optimum rice production. Since rice is no longer grown in the area, the abandoned rice fields have become remnants of an ante-bellum era of hard work and innovation.

Rice culture began in South Carolina after the introduction of the Madagascar Gold seed to Charleston around 1680. Subsequently large rice plantations grew along the scenic tidal rivers of the lower Coastal Plain from the tireless labor of a slave based agriculture

¹ dike- an embankment for controlling or holding back the water of a sea or river (Webster Collegiate Dictionary).

(Salley, 1936). Dr. Richard Porcher, author of several publications on Lowcountry rice culture, equated the amount of slave labor required to clear the rice fields and construct the dikes, ditches and trunks to the amount of labor required to build the Egyptian pyramids. Bottomland hardwoods were converted to rice fields and miles of ditches and dikes were constructed. Reaching peak production between 1850 and 1860, annual South Carolina rice production totaled 3,500,000 bushels. Cooper River plantations alone planted over 6,000 acres yielding 180,000 bushels in 1860 (Doar, 1936).

The Lowcountry rice producing years were a golden era in the South Carolina Lowcountry which lasted nearly 250 years. Several large hurricanes in the early 1900's and falling rice prices shifted rice production to Louisiana and Mississippi and ended the glorious age in the Carolinas and coastal Georgia. As artifacts of the bygone culture, the many acres of old rice fields have become important ecological systems and historical reminders. Since the fall of the rice culture, some fields have been managed as waterfowl habitat and others as fishing ponds. Still other fields have been left unmanaged, allowing nature to inhabit with vegetation and many wildlife species. Regardless of condition, the rice fields have become important Lowcountry habitats.

A number of invertebrates and fish, notably the blueback herring, now use the fields during their life cycle and are thus dependent, to some extent, on the viability of the fields (Christie et al. 1981, Odum et al. 1984, Wenner et al. 1986, Eversole et al, 1992). Other animals, such as alligators, otters, aquatic organisms and many bird species use the rice fields in some way. Ospreys and bald eagles, which have made a great comeback in recent years, utilize the open and shallow fields as feeding grounds. For these and other animal species,

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rice fields have unique ecological life supporting habitat that if no longer in existence, may force these species' decline and relocation.

Evidence indicates plant successional processes are slowly transforming the fields from the open water fields left by the rice culture to bottomland hardwood and tidal freshwater swamps. Since bottomland hardwoods and tidal freshwater swamps do not function exactly as the rice fields do in their current state (Mitsch and Gosselink, 1993), area scientist feel that key functions and values characteristic of the current river ecology may be lost as the rice fields' conversion progresses. Natural ecological succession is a slow process, but the water flow manipulations of 1942 and 1985 have enhanced the rates of succession on the Cooper River (Kelley et al. 1996). As a result, area land managers and conservationist are in need of addressing this question: Do we stop the successional processes occurring within the rice fields or do we allow them to continue?

Aerial photography and image analysis by Kelley et al. (1996) was able to determine the chronological sequence of events leading to the successional processes on the Cooper River. Prior to 1985, the water levels on the Cooper River were high enough to prevent most plants from growing within the fields. When the 1985 Re-diversion project lowered the Cooper River's average water level, the rice field's bottom was subjected to rooting by aquatic plants that previously were unable to root. The pattern of successional advance has been documented and occurs as follows. First, floating aquatics, such as *Ludwigia sp.* and *Eichhornia crassipes*, proliferate throughout the rice fields and the accumulation of organic matter begins. As detritus buildup continues, more plants are able to become established as the fields progress through the successional stages until the accumulation of organic matter is

so great that hardwoods are able to grow. This sequence of vegetational invasion converts the rice fields from open water to swamp forest. On the Cooper River, the situation is unique because the rate at which these processes are occurring has been increased by man's influences.

Dr. Joe Kelley and Dr. Richard Porcher, both of The Citadel's Biology Department, have been studying the successional advance of vegetation within the rice fields for close to two decades. They estimated the number of acres of Cooper River rice fields in various successional stages and classified them as one of five stages according to the amount and type of vegetation present within the fields (Table 1). Successional stages range from open water (Stage I) to swamp forest (Stage V). All Stages, except Stage V, are currently represented on the Cooper River. Thirty-eight percent of all Cooper River rice fields are currently classified as Stage II or higher. Stage I fields, classified as such because they are most near their original state, comprise only 45% of the fields (Table 2) (Kelley et al. 1995, unpublished work by Kelley et al. 1996).

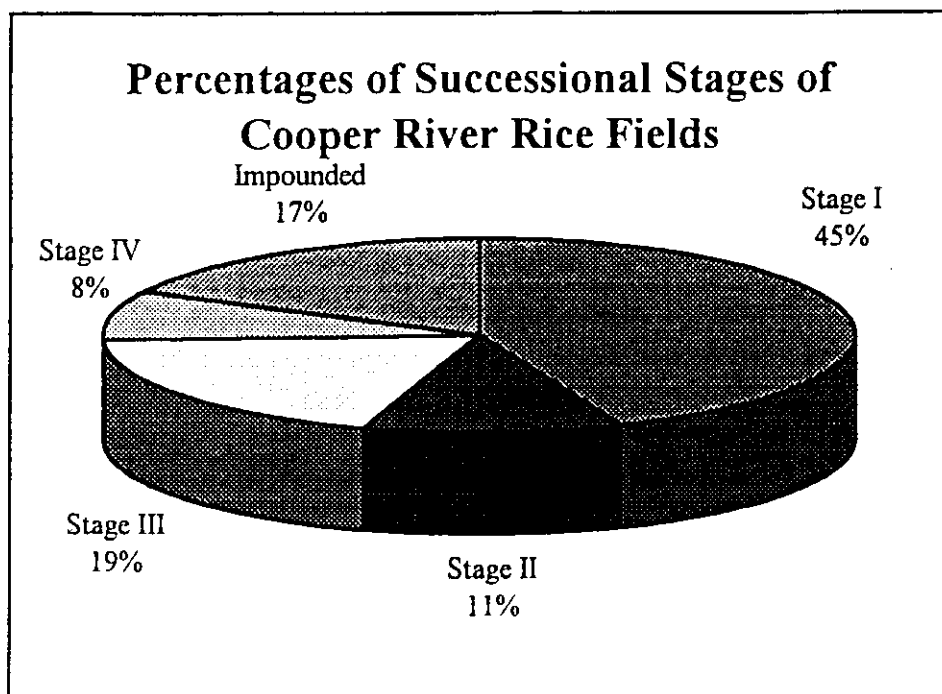
At present there is not enough evidence to say succession will negatively impact all animal populations on the river. However, habitat and population studies do suggest certain populations will be adversely impacted more than others. Since re-diversion, Thomas et al. (1992) have recorded decreased numbers of blueback herring spawning in the rice fields, a result they attribute to lowered water levels reducing suitable available habitat within the rice fields. Despite the evidence, a consensus on the fate of the rice fields and the ecological impacts resulting from the rice fields' succession has not been reached, and as a result scientists and policy makers are divided over the issue.

Table 1 *Field cover categories and successional stages and percentages of the abandoned rice fields of the Cooper River (Kelley, Porcher and Oswald, unpublished work, 1996)*

<u>Field Cover Categories</u>			
	Classification	Criteria	Genus Present
I	Subtidal Open Water/Submergent Vegetation (OW)	Largest % of field is subtidal with open water/ submergent macrophytes	<i>Cabomba</i> <i>Ceratophyllum</i> , <i>Egeria</i>
II	Subtidal Ludwigia/Eichornia/ Polygonum (LEP)	Largest % of field is subtidal with but specific plants are present which are present at least part of the time on the surface of the water	<i>Ludwigia</i> <i>Eichornia</i> <i>Polygonum</i>
III	Intertidal Emergent Mix (ITEM)	Largest % of field is intertidal with a complex mix of emergent macrophytes dominated by certain plants. Flooded daily at high tide.	<i>Pontederia</i> <i>Peltandra</i> <i>Scirpus</i> <i>Alternanthera</i> <i>Zizaniopsis</i> <i>Cicuta</i> <i>Apios</i>
IV	Intertidal Developing Swamp Forest (DSF)	Tree and shrub cover less than 50% of field but detectable in aerial/satellite photography. Discount trees on interior dikes and high spots. Intertidal Emergent Mix (ITEM) cover largest majority of field.	<i>Salix</i> <i>Nyssa</i> <i>Acer</i> <i>Myrica</i> <i>Baccharis</i>
V	Intertidal Swamp Forest (SF)	Tree cover largest percentage of field. Understory is ITEM. Saturated soils flooded on spring tides	<i>Salix</i> <i>Nyssa</i> <i>Taxodium</i> <i>Acer</i> <i>Myrica</i> <i>Baccharis</i>

Table 2 *Stage totals and field classification percentages. Notice, there are currently no Stage V rice fields on the Cooper River, yet (Kelley, Porcher and Oswald, unpublished work, 1996)*

Successional Stage Totals and Percentages for the Cooper River		
	Total Acreage	Percentage of Cooper River Rice Fields
Stage I	3082.7	43.8%
Stage II	794.6	11.3%
Stage III	1342.1	19.1%
Stage IV	596.7	8.5%
Stage V	0.0	0.0%
Impounded	1228.9	17.4%
Totals =	7045	100.0%



Among those associated, two schools of thought exist regarding the future of the rice fields and succession's impacts. Some feel the successional processes are nature's means of returning the fields to their original state as bottomland hardwood and, indeed, bottomland hardwood is the ecosystem toward which succession is moving. A solid basis for this argument does exist. At the dawn of the rice culture, thousands of acres of bottomland hardwood adjacent to tidal freshwater rivers were converted, to fully enclosed, water controllable rice fields (Doar, 1936). According to this view, nature, if unabated, will and should be allowed to reconvert the old rice fields to systems long ago destroyed. If certain present functions and values of the fields are lost, then we should not interfere.

At the same time, others insist these fields, regardless of their origin, exist, and have become important ecosystems and viable supporters of wildlife and vegetation. Preservation of the fields would ensure that further change would not occur and a status quo would prevail. From this viewpoint, the Cooper River is a unique system worth saving in its current state. Typically, conservationist and society view unaltered environments as the most desirable and pristine. Yet, on the Cooper River, some view the state in which the river currently exists as the preferred condition. This may mark the first time that man and his manipulations (i.e. the conversion of bottomland hardwood to the rice fields) have produced an environment preferred and actively preserved by society. If a management goal could be devised that would preserve the current state of the river, then the heritage of the rice culture and the present species that inhabit the rice fields today could persist.

To complicate matters further, there is an underlying legal discrepancy over the ownership of the rice fields and what owners can and cannot do with them. Legally, the rice

fields of the Cooper River are treated differently according to the physical status of the dikes surrounding the fields. If a landowner has rice fields whose dikes are entirely intact and without breaches, then legally, he owns the entire field and the water overlying the field. But if his fields are not entirely enclosed due to breaches in the surrounding dikes, then he does not solely own the rice field and his ownership and property rights are somewhat questionable. For all practical purposes, a breached field landowner owns the actual land under the water and pays taxes on this land, but the overlying waters are considered part of the State's public trust and therefore subject to the use and enjoyment by the public. In recent years, the discrepancies over ownership and publicized battles over property rights have increased the strain on the relationship between the landowners of the Cooper River rice fields, the State and the agencies regulating activities within the rice fields. In many ways, these legal problems overshadow the ecological issues surrounding the river's rice fields.

In addition to the ownership discrepancies concerning the rice fields, taxes have also become an issue. Classified as wetlands, rice fields are appraised at a value of \$100 per acre and the taxes that an owner must pay, regardless of whether the fields' dikes are breached or intact, is based on this appraised value of the field. For example, an individual owning 100 acres of rice fields would pay \$119.70 ($\$100/\text{acre} * 100 \text{ acres} * 6\% * 0.1995 = \199.75) in taxes per year (personal communication, W. Reeves Lewis, Berkeley County Tax Assessor's office, 1997). Although not an exorbitant rate, landowners feel that because they pay taxes, they should have the right to conduct activities as they please. Landowners, particularly those owning breached fields, resent paying the taxes without being able to manage their property as

they wish. Consequently, landowners feel indignant toward agency regulations of rice field activities.

Governed by both State and Federal law², actions within the rice fields are severely limited. Unless a landowner's fields are intact and fully enclosed by a dike, management practices of any significant nature (i.e., re-diking, planting, and ditching) are prohibited. A landowner whose dikes have been breached for a period of two years or more no longer has the right to exclude the public from the fields, and the dikes must remain open according to Nationwide Permit #3 of 33 C.F.R 330 (personal communication, Steven Coker, USACE, Environmental Engineer, 1997). Many landowners are not comfortable with the situation and some have even litigated, with no success, to establish the ability to re-enclose several breached fields (DeVoe and Baughman, 1986, Kendall, 1994).

Regardless of their exact legal situation, the landowners have not been pleased with the encroachment of the Federal and State power, and tension between the landowners and the governmental agencies has developed. As a result of both the legal issues and the scientific issues, policy making and management attempts have been avoided and priorities have been focused on gathering data. Scientists need to determine as precisely as possible, the ecological processes occurring on the river and its watershed and the impacts, if any, associated with allowing successional advance to continue within the rice fields. Policy makers need to determine management implications of a basin-wide management plan and also determine feasibility of management choices. And finally, the general public and landowners,

² Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act of 1977. The Federal Water Pollution Control Act of 1972 was renamed the Clean Water Act in 1977 when Section 404 was added (Kalo et al. 1994).

with the help of area managers, need to develop general management plans and goals for the old rice fields and the Cooper River.

To this end, I surveyed landowners of Cooper River rice fields with the help of Dr. Joe Kelley, and the Charleston Harbor Project³. The survey had three objectives: to determine whether landowners from their everyday workings and interactions with the fields and their property are aware of successional changes since the 1985 re-diversion project; to determine how amiable landowners would be toward a cooperative basin-wide management plan on the Cooper River; and to establish a rapport with Cooper River landowners by acting as a liaison between the State and the landowners in an attempt to bridge the gap between the two. Hopefully, the results of the survey will help the agencies, managers, landowners, and the general public establish common goals for the Cooper River. At the same time, I hope a basin-wide management plan can be adopted to accommodate all those who want to be a part, for the benefit of the Cooper River and the intricate and unique ecosystems of its watershed.

METHODS

For the purposes of this thesis and in fulfillment of employment for the Charleston Harbor Project, I am reporting the results and conclusions of a survey conducted of the landowners of the Cooper River rice fields. Thirty-nine questions were initially formulated and landowners were interviewed face-to-face in an informal discussion of the issues. Answers to the questions were extracted from the discussion. I did not strictly adhere to survey methods, per se, but referenced Dillman and Salant periodically.

³ The Charleston Harbor Project is a division of the Ocean and Coastal Resources Management concerned with the Charleston Harbor and its surrounding watersheds and its capacity to withstand and support area human population increases.

Initially, forty-three riverside properties potentially bounding rice fields were identified by using the historical extent of the rice fields and gleaned valuable information from local rice field authorities⁴ (Figure 2, Cooper River Landowner, map of property boundaries). Exact property lines, owner names and addresses were obtained from the Berkeley County Tax Assessor's office and 1983 tax maps. From the initial list of forty-three, thirty separate ownership entities were identified by four classifications. The four classifications of ownership were: 1) sole owner, 2) family owned, 3) partnership owned, 4) business/industry owned. Some properties were combined and treated as one parcel. For example, if a mother, brother and sister owned three parcels of adjacent property and managed all three parcels by one regimen, then the three parcels were surveyed as one entity. In some cases, I interviewed plantation managers either because the owners were not available or the managers were more knowledgeable of the properties' rice fields.

Of the forty-three initially identified, four landowners did not have rice fields and other landowners were combined, leaving twenty-six in the final set of rice field landowners. Initial contacts were made through Dr. Richard Porcher with subsequent contacts being made through those already interviewed. In all, twenty of the identified twenty-six were surveyed for a response rate of 77%. The landowners I did survey were more than willing to meet and discuss their positions and feelings. Their cooperation and hospitality were much appreciated.

⁴ Dr. Richard Porcher, The Citadel Biology Department, helped me with initial contacts. Barry Jurs, of the Berkeley County Soil and Water District, also helped identify the property owners.

Cooper River Landowners

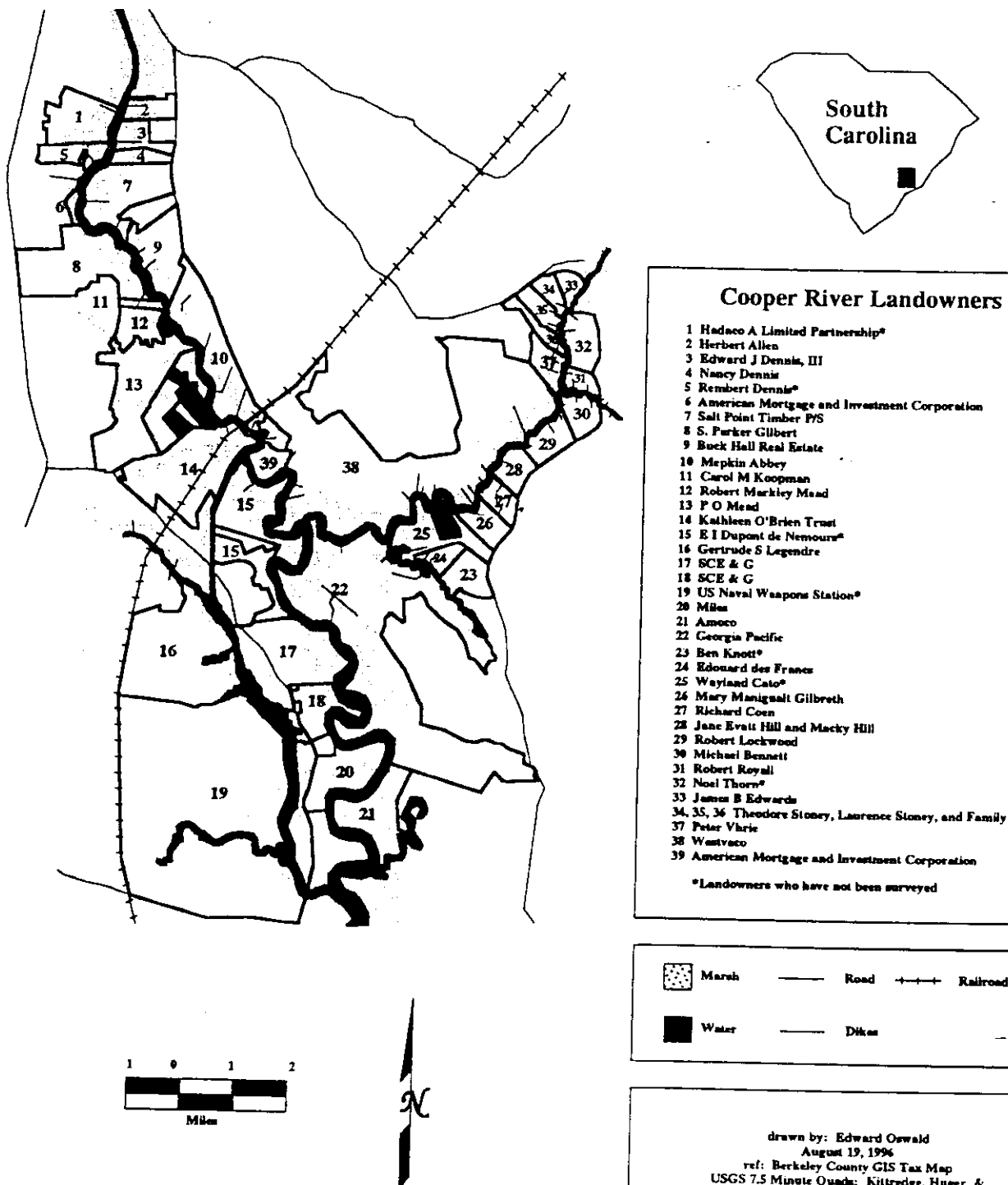


Figure 2 Property boundaries of potentially surveyed landowners. Map shows West and East Branch of the Cooper River and remnants of some rice field dikes.

RESULTS

Survey results are given in Table 3. The original 39 question survey was *post priori* edited, and twelve questions of little relevance were removed. Appendix A lists the landowners by number and their responses to each of the original 39 questions. Landowner names are omitted for legal and ethical reasons which would otherwise make their disclosure problematic. Also shown in Appendix A (and also shown by color coding in Figure 3, Map of Landowners: Rice Field Categories) are the type of fields owned by each of the landowners, whether breached, impounded or both.

Eighty-three percent of the surveyed landowners said they have observed wildlife/ecological and recreational changes along the river since the 1985 Cooper River Re-diversion Project (Table 3, Question 25). Since so many have observed changes, many of the landowners had little trouble accepting the scientific basis for the changes. Most landowners are in and among the old rice fields on at least a weekly basis and have noticed the changes firsthand. The most often repeated "change" cited by the landowners was lowered water level, and some identified the 1985 re-diversion project as the cause.

Eighty-one percent of the surveyed landowners stated they used their rice fields for the following reasons: 1) 39%- aesthetic reasons, 2) 23% -waterfowl hunting and 3) 19%- fishing (Table 3, Question 7). Fourteen of the twenty surveyed manage or practice some type of conservation on their rice fields (Table 3, Question 12). Of those not actively managing their rice fields, most stated breached dikes as the reason and that they felt as though management efforts would only benefit the non-paying public. Furthermore, the breached dikes surrounding their fields won't allow water control, and without water control, management

options are limited. As a result, many of the breached dikes are neglected and becoming increasingly unsalvageable. With laws forbidding the reconstruction of dikes which have been destroyed for longer than two years, landowners have in some cases been forced to allow the fields to overgrow with vegetation. Unable to effectively manage in the breached fields, some landowners have become apathetic to the condition which their fields have assumed.

Citing agencies' policies and current Federal and State law, nearly eighty percent of those surveyed felt they could not conduct rice-field management as they pleased (Table 3, Question 19). In all cases, landowners were well aware of the governmental agencies responsible for the primary regulation of land use and the laws that were preventing their actions. At the same time though, 63% of surveyed landowners felt cooperative actions, between themselves and the regulating agencies, promoting the welfare of the rice fields was a viable option (Table 3, Question 22). Nearly 63% also stated they would be interested in participating in a basin-wide management plan if it improved conditions on the Cooper River (Table 3, Question 28). To the landowners, improved conditions would mean increased functionality of the rice fields. Most want the vegetation removed, boat access restored, and increased latitude of management options.

DISCUSSION

Management practices within the old rice fields along the Cooper River varied in type and intensity with the majority of management efforts being concentrated within still-functioning impounded fields rather than breached fields. Landowners gave numerous reasons for management such as fishing ponds, aesthetic reasons and waterfowl habitat. Contrary to

popular opinion, not all impoundments are managed strictly for hunting waterfowl, which indicates that if a basin-wide management plan is devised, landowners would not be interested in re-diking solely for waterfowl hunting purposes.

In fact, survey results show only 23% of those surveyed manage impoundments for waterfowl (Table 3, Question 12). In most of these cases, priority of waterfowl management is given to inland reservoir fields detached from the river. Little effort is given to exclusive waterfowl management on river adjacent fields for two primary reasons. First, many of the impounded fields are in uncontrollable states with either leaky dikes or dysfunctional trunks. Secondly, impounded fields with large duck populations are subject to trespassing during duck season, and landowners, citing the possibility of conflict and the legal ramifications of injured trespassers, want to avoid such situations.

The majority of breached fields are located on the East Branch of the Cooper River, whereas the majority of the impounded fields are located on the West Branch just below Pinopolis Dam (Figure 3, Map of Landowners, Rice Field Categories). Many of the landowners reported that the original Santee-Cooper diversion project had rebuilt and strengthened dilapidated dikes and installed new trunks along the West Branch just prior to 1941. The Army Corps of Engineers first diverted the water from the Santee River into the Cooper River in order to provide the South Carolina Public Service Authority hydroelectric plant with increased water flow and to decrease the frequency of floods in the Santee watershed. As a result, water flow in the Cooper River increased from 100 cfs to approximately 15,600 cfs and sediment deposition in Charleston harbor increased. In order to keep shipping lanes from closing, dredging activities increased. So, in 1985, the Army Corps

Cooper River Landowners

Rice field Categories

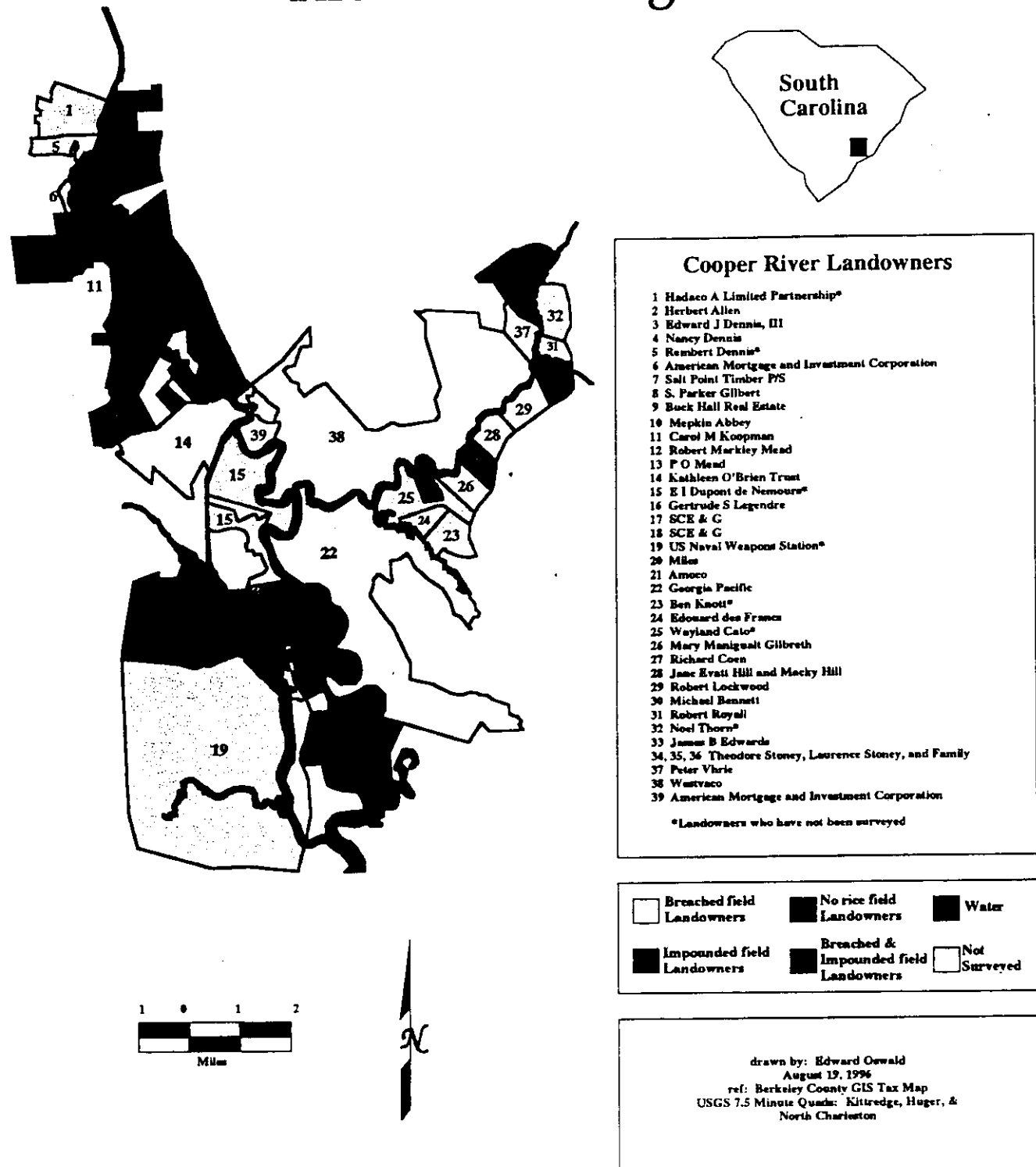


Figure 3 Landowner properties classified according to type of fields owned, whether breached or impounded or both.

of Engineers corrected the problem by constructing the re-diversion canal and the St. Stephen Dam connecting Lake Moultrie to the Santee River (US Army Corps of Engineers' publication: Santee Cooper Anadromous Fish, Fish Passage and Restoration). This project decreased the flow in the Cooper River from 15,600 cfs to 4500 cfs and helped alleviate the dredging problem within the harbor (personal communication, Sarah Brown, Hydroelectric engineer, USACE, 1997). Built to withstand flow rates over 15,000 cfs, the rebuilt dikes along the West Branch have been more resilient to the influx of vegetation than the breached fields along the remainder of the river. In many cases, the landowners along the West Branch have the ability to drain their rice fields and physically manipulate the water level and vegetation growing within them.

Breached rice fields are predominantly not managed because the breached dikes prevent the control of the water level within the fields. With an uncontrollable river nexus through destroyed dikes, management in the breached fields is futile and unproductive. Management options are therefore limited. If, for instance, a landowner wanted to remove the vegetation in the old rice fields and restore some accessibility to a breached rice field, he would be limited to chemical treatment because other methods would require control of the field's water level (personal communication: Mark Sheppard, 1996). Regardless of the method, though, his efforts would be wasted because the next incoming tide would bring an influx of re-colonizing vegetation. Consequently, landowners are unwilling to spend time or money on management of these breached fields. As a result, nature and successional advance have rapidly invaded some breached fields to the point of completely blocking openings once easily entered by boats. Historically, breached dikes have been excellent recreational fishing

holes, but the vegetation and reduced water flow have made some holes inaccessible to either landholder or the public (personal communication with local recreational fishermen and landowner, 1996).

Despite being physically unmanageable, breached fields are still valuable to the landowners and the public. Many of those landowners who stated they used their fields for aesthetic purposes (i.e. bird watching, existence value) own breached fields. From a landowner's viewpoint, though, the greater management flexibility of impounded fields makes them slightly more valuable than breached fields.

Legal restrictions and discrepancies over ownership have, in some cases, kept owners from actively managing their property. When asked whether regulations should be relaxed concerning activities in and among the rice fields, fifteen of the twenty interviewed stated yes (Table 3, Question #21). Many of those who agreed had been previously involved with a legal discrepancy or a permitting issue in which they were not allowed to proceed according to their plans. Most permit applicants wish to re-dike breached fields whose dikes have gone unrepaired for more than two years. Despite the fact that the permitting process offers the landowner with a course of action for seeking approval of a re-diking project, the landowners feel attempts at permits to be a unproductive waste of time and energy.

Currently thirteen federal, state and local agencies can be involved in permitting activities in and among rice fields, but only approval from the Army Corps of Engineers and the South Carolina Department of Health and Environmental Control are needed (DeVoe et al., 1987, Kalo, 1994, personal communication, Steven Coker, USACE, 1996). Nonetheless, landowners are discouraged and intimidated by the permitting process. Consequently, the

relationship between the landowners and the regulating agencies has not been fostered and interaction between them has been limited.

As a result, few re-diking projects have been granted permits on the Cooper River (Devoe et al. 1987). Landowners blame the agencies for rejecting proposals, but the agencies (The Army Corps of Engineers and the South Carolina Department of Health and Environmental Control, SCDHEC) are merely upholding current law. Both wetlands law and navigable waters law, outlined in the Rivers and Harbors Act of 1899 and the Federal Water Pollution Control Act of 1972 which was later renamed the Clean Water Act in 1977, govern the issuing of project permits (Kalo et al. 1994, personal communication, Steven Coker, USACE, 1996). The permitting process is consistent and unbiased, but very restrictive. Still, landowners feel they have been unfairly treated at times. Lines have been drawn and sides taken while permitting wars and ownership discrepancies overshadow the needs of the Cooper River. Hence, a continuing battle between the two sides has borne an unproductive belief that nothing can be accomplished and that neither side will concede.

Despite the seemingly never-ending battle, some hope for the relationship between the agencies and the landowners does exist. Recently, a mitigation banking project along the Cooper River was very near acceptance. Although the project was eventually disapproved, the degree of cooperation between the agencies and landowner can serve as a precedent for future interactive discussions of management objectives and common goals on the Cooper River.

Furthermore, when landowners were asked if they would be interested in participating in a cooperative management plan, if the agencies, landowners and public could agree on what

that plan would be and could determine benefits to all enjoying the river, 63% of the landowners stated yes (Table 3, Question #22). Many acknowledged that in their old rice fields, current conditions necessitated an immediate cooperative management approach. One landowner stated, "My fields, though breached and open to the public, are of no use to anyone. I can't get out there and the public can't get in. No one is using the fields or enjoying their recreational potential, so why not let's do something to reclaim them."

It does seem ironic that such a large percentage of landowners should support a common management objective, given that so many also stated they felt restrictions were currently too tight. Limitations and regulations would be inherent aspects of any management plan initiated on the Cooper River, so why are the landowners so willing to cooperate when they already feel overwhelmed by current regulations? The landowners would like to see progress and increased agency attention given to the Cooper River. By yielding to their concerns for the river, many landowners appear willing to bear additional restrictions and regulations (Table 3, Question #27). As stated earlier, some fields are used by no one, neither the public nor the landowner. In such cases, any progress to restore lost functions and values would be forward thinking.

Landowners are increasingly aware of historical and ecological significance of the rice fields and the surrounding land areas. Over half of the surveyed landowners stated they either have or plan to have conservation easements established to preserve the rice fields (Table 3, Question #17). I believe this gesture by the landowners exhibits an awareness of the situations surrounding the rice fields and a general concern for the rice fields as ecological habitat and historical artifacts. Attitudes are changing and common goals are being identified.

A greater cause, the Cooper River and its well-being, is at the forefront of agendas and a willingness to at least listen to the other side seems to be growing. Now more than ever, a basin-wide management project may be achievable.

A Movement Towards a Basin-wide Management Plan

The goals of any basin-wide management plan would have to be flexible and diverse. A sustainable plan could be formulated that would benefit all parties with the objective view that some rice fields in their current state need to be reclaimed from successional advance because they are a significant and important part of the ecology and history of the area as they are today. If a plan of this sort can be established, ecological changes could be reversed in some areas and allowed to proceed in others insuring a diverse array of fields representing all successional stages. The alternative to a basin-wide management plan would be inaction, or a policy of no physical alteration. In such case, the fields would be allowed to progress through the successional stages toward an equilibrium stage, swamp forest. If this is the chosen course of action, then so be it, but a decision does need to be made as to whether we should manage the river or not.

If the chosen management goal is to re-dike and reclaim some of the breached rice fields, two management strategies are possible. One, if permissible by the Army Corps of Engineers, water flow could be increased through the Pinopolis Dam. In doing so, the fields would be re-flooded and successional advance retarded. This course of action, though, seems unlikely for two reasons: (1) it would undo the initial reasons for the re-diversion, which were to reduce silting and thereby dredging in the Charleston Harbor, and (2) the exact

amount of water flow needed to accomplish this is unknown. The second strategy which is a more feasible course of action would be to select fields of significant and unique ecosystem importance and re-dike. By reinstalling functioning water controllable structures, vegetation could be removed in a number of ways (i.e. herbicides, draining and drying, etc.) and the fields returned to pre-1985 conditions. For those opposed to re-diking, alternative management plans could adopt a schedule of re-diking, restoration and subsequent dike destruction. Selected fields could be re-diked and returned to less advanced successional states, with subsequent dike destruction leaving the landowner and the public with access that was previously unavailable because of vegetation and growth. Permanent ownership problems would then be alleviated and less controversial once the re-installed dikes were later destroyed. Management could be carried out by both the landowner and the agencies involved, with the interest of all parties, including the public and the landowners, in mind.

As another management alternative, a system of weirs could be established in the openings of the breached dikes. Weirs would allow full tidal inflow of water, but would restrict outflow to a certain level. With a sustained higher water level, overwhelming and encroaching vegetation could be controlled. Boats could then navigate the breaches and enter fields.

As a set of possible management options, weirs must be included but realistically, limitations will hinder their implementation. Once installed, weirs become permanent structures and may limit rather than expand management options. Fields can not be completely drained and therefore neither plowed nor planted. The only real purpose a weir

system could provide is vegetation removal, as opposed to the numerous management options of a re-diking plan.

Regardless of the management plan, discrepancies and disagreements will arise. Who would actually own the newly impounded fields? Who would be able to use the fields? Who would determine and what would the specific strategies of each field be (i.e. fish ponds, waterfowl habitat, etc.)? Questions of this nature could be negotiated by the management plan's governing body, which must include members of the regulating agencies, the public and the landowners. Despite the legal issues surrounding the ownership, the landowners do own the fields and still pay taxes on the fields, which makes them an important asset to any potential management plan.

Perhaps the most important question concerns funding for proposed projects. Any conceivable management plan will be costly. Dike maintenance and repair can be as much as \$1000 per dike foot, and trunks cost between \$6000-\$7000 to build and install (Dean Harrigal, Donnelly WMA, personal communication, 1996). Rice field upkeep and maintenance is also time consuming. Well maintained fields are monitored at least once during each tide, and water elevation adjustments are made according to the management intended and the season.

Implementing a basin-wide management plan will be a large task. Scientists, policy analysts, managers, landowners and the public will all be involved if such a plan is to succeed. Conceivably, a basin-wide management plan could be devised that encompasses the rights and wishes of all parties involved and creates a diverse habitat plan along the Cooper River that

would manage for ducks, fish, wading birds, heritage, aesthetics, vegetation and recreation etc.

But why would we want to intervene? To automatically assume that functions and values of the fields as we know them today are not being lost is presumptive. Now is the time for study, because the successional processes that are converting the rice fields to swamp forest are closing our window of opportunity to determine whether we are losing key functions and values of the present rice fields. The successional processes on the Cooper River continuously progress, while we sit idly by and watch. If we are to accomplish anything, then the time is now.

CONCLUSION

As managers and stewards of the Cooper River and its surrounding watershed, we need to make a decision. Do we manage the river or not? If so, then what management goals do we set and who will carry out these plans. To be successful, a cooperative management effort will have to include both the landowners and the public, but the landowners should not be required to incur all costs of a management plan. Public interest must be balanced by increased landowner flexibility as long as both parties' wishes are within the bounds of the chosen management plan.

According to my survey results, landowners are not happy with the current state of affairs on the Cooper River, and for that reason, landowners are willing to cooperate with area managers on new approaches to old problems. Whether the decision is to manage the Cooper River or leave it "as is", the situations on the Cooper River are unique and will serve as an

example of how man has manipulated his surroundings and produced a situation in which the anthropogenic ecosystems may be the more desirable stages of a changing system. Regardless of what management objective is chosen, the time for action is now! The succession processes are waiting for no one and our window of opportunity to decide if we want to reclaim some fields and stop successional advance is closing.

Given its history and the current situations, the Cooper River system is a unique study of the effects of man and the resultant decisions that must be made. The successional processes occurring on the river are indirectly the result of man's actions. These successional advances are occurring in other comparable river systems, but at much slower rates. For this reason, the Cooper River system will also serve as a model for successional advance.

ACKNOWLEDGMENTS

I would like thank Dr. B.J. Kelley, The Citadel's Biology Department for providing the opportunity for me to work with him and Dr. Richard Porcher, The Citadel's Biology Department, for the suggestion and the introductions to the landowners. Thanks also goes to Shirley Conner of the Charleston Harbor Project for providing technical and logistical support and to Heyward Robinson, also from the Charleston Harbor Project, for ultimately giving me the job.

Throughout the entire process, Barry Jurs, Conservation Specialist of the South Carolina Department of Natural Resources, and the Berkeley Soil and Water District were a great source of help and inspiration. Furthermore, thanks goes to Michael Jacobson, Steven

Coker, Dean Harrigal, Hunter Robinson, Mark Shepherd, George Nelson and the countless others who helped.

Last but not least and certainly most important, I want to thank the landowners who were hospitable and helpful to the very end. Without them, I would not have had the opportunity to expand my people skills and policy experience. It was a very valuable lesson in life. Thank you all.

Table 3 Questions, frequencies of answers given and most often repeated answer of surveyed landowners.

Question	Frequency of Possible Answers										Most Frequent Answer
	0	1	2	3	4	5	6	7	8	Totals	
1 How long have you had you land?		7	4	3	4	2				20	35% - 1) Less than 10 years
2 What is the nature of the ownership of you land?		8	7	1	2	2				20	40%- 1) Sole Owner
3 Are these rice fields designated King'sgrant, State's grant, Proprietary grant, or none of them?		4	8	0	8					20	40%- 2) King's Grant; 40%- 4) Didn't Know
4 How many acres of land, including uplands, do you own on the particular tract containing the rice fields?		0	2	3	1	9				15	60%- '5) Greater than 700 acres
5 Approximately how many acres of rice fields do you own?		4	8	2	1	3				18	44%- 2) 101-200 acres
6 Are your rice fields utilized in any way?		17	3							20	85%- 1) Yes
7 How are your rice fields utilized?		7	12	6	2	0	1	3		31	39%- 1) Aesthetic purposes; 23%- 2) hunting waterfowl; 19%- 3) fishing
8 Who utilizes your rice fields?		9	2	2	0	4	2	3		22	41%- 1) Family/friends
9 Do you charge for the use of these rice fields?		4	16							20	80%- 2) No
10 Are your fields open to the public?		14	6							20	70%- 1) Yes
11 Do you have control over the public use of the fields?		12	8							20	60%- 1) Yes
12 Do you currently practice any type of management or conservation on the rice fields of your land?		14	6							20	70%- 1) Yes
13 Which type of rice fields do you manage?		3	9	3	3					18	50%- 2) Impounded fields
14 What type of managment do you practice?		3	1	3	9	5				21	43%- 4) Combination (weeds, waterfowl, wildlife, maintenance, 67%- 2) Private funds from landowner
15 How is the managment paid for?		1	10	2	0	1	1			15	
16 Are you involved with any conservation?		10	9	0	1					20	50%- 1) Yes; 45%- 2) No
17 Are there any easements or land grants given of your rice fields?		6	4	5	6					21	53%- 1) & 3) combined = have or plan to have land grants or
18 How much annually do you spend on managment of any sort on the rice fields?	3	7	5	0	3					18	39%- 1) Less than \$1000; 28%- 2) between \$1000 and \$5000
19 Can you do what you want with the rice fields?		4	15							19	79%- 2) No
20 If no, have your limited options kept you from actively managing your fields in the ways that you would have liked?		9	5	1						15	60%- 1) Yes

Table 3 Questions, frequencies of answers given and most often repeated answer of surveyed landowners.

	Question	Frequency of Possible Answers										Most Frequent Answer
		0	1	2	3	4	5	6	7	8	Totals	
21	Do you think that regulations should be loosened or tightened concerning the preservation and conservation of the rice fields?		15	0	4						19	79%- 1) Yes
22	Would you be interested in more cooperative actions should it be determined that the regulatory agencies, the public and the private landowners could agree on management and benefits to all parties?		11	7	1						19	58%- 1) Yes
23	If rediking were possible, would you consider it?		13	1							14	93%- 1) Yes
24	Would you be interested in a cooperative management program with the state and some degree of public access if you could redike?		8	8							16	50%- 1) Yes; 50%- 2) No
25	Have you noticed any wildlife/economic/ecological/recreational changes in the rice fields and the surrounding river over the time that you have owned your		15	3							18	83%- 1) Yes
26	What is the one thing you would like to change about any aspect of anything concerning the rice fields?		3	1	1	0	0	0	3	7	15	47%- 8) Combination of some of the above
27	If a management plan were devised that was based on a broad view of what the Cooper River Drainage Basin needs to maintain its quality, would you accept limitations on what you could do with your fields for the benefit of the basin?		12	5	2						19	63%- 1) Yes

Table 4 *Field classification (Table 1) and acreage according to 1994 aerial photography (Kelley, Porcher, and Oswald, unpublished work, 1996)*

Field Acreage and Classification

<u>Field Number</u>	<u>Branch of Cooper</u>	<u>Acreage</u>	<u>Successional Stage</u>
1	West	160.0	III
2	W & E	228.9	I
3	East	457.6	I
4	East	8.8	II
5	East	17.5	III
6	East	119.2	III
7	East	18.5	II
8	East	12.2	III
9	East	322.5	II
10	East	181.8	III
11	East	54.9	II
12	East	59.8	II
13	East	16.0	III
13b	East	29.1	IV
14	East	21.6	III
15	East	17.7	IV
16	East	16.2	IV
17	East	3.1	IV
18	East	4.8	IV
19	East	25.3	IV
20	East	48.1	III
21	East	10.3	III
22	East	5.1	III
23	East	35.7	III
24	East	19.7	IV
25	East	16.8	IV
26	East	35.0	IV
27	East	14.9	Impounded
28	East	45.0	III
29	East	52.1	II
30	East	63.4	II
31	East	43.1	II
32	East	50.1	II
33	East	87.3	Impounded
34	East	24.9	II
35	East	525.1	I
36	East	23.0	III
37	East	53.1	III
38	East	40.3	II
39	East	106.3	IV
40	East	14.2	III
41	East	142.9	IV
42	West	374.6	III
43	West	9.0	IV
44	West	35.6	I
45	West	254.9	I
46	West	47.4	III

Table 4 *Field classification (Table 1) and acreage according to 1994 aerial photography (Kelley, Porcher, and Oswald, unpublished work, 1996)*

<u>Field Number</u>	<u>Branch of Cooper</u>	<u>Acreage</u>	<u>Successional Stage</u>
47	West	143.3	I
48	West	30.4	II
49	West	25.8	II
50	West	216.1	I
51	West	121.6	I
52	West	368.0	I
53	West	85.5	I
54	West	8.5	I
55	West	51.4	IV
56	West	28.5	III
57	West	213.1	I
58	West	325.4	I
59	West	99.0	I
60	West	40.8	III
61	West	87.9	III
62	West	119.3	IV
82	West	27.3	Impounded
83	West	44.7	Impounded
84	West	155.1	Impounded
85	West	97.5	Impounded
86	West	185.5	Impounded
87	West	149.8	Impounded
88	West	68.8	Impounded
89	West	72.6	Impounded
90	West	53.1	Impounded
91	West	109.4	Impounded
92	West	48.8	Impounded
93	West	42.4	Impounded
Limerick	East	71.8	Impounded
Total		7045	

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APPENDIX A
Culmination of Responses

QUESTIONS		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	Type of fields contained on the property regardless of management preferences.	I	B	B&I	B	B&I	B	B&I	B	B	B	I	B&I	I	B	I	B	B	I		B	B&I					B&I	B		NONE	NONE	NONE	NONE
1	How long have you had your land?	5	2	4	2	1	1	4	2	1	3	1	1	1	1	3	4				2	5					4	3		DA	DA	DA	DA
2	What is the nature of the ownership of your land?	2	1	2	5	1	1	2	1	1	4	1	2	1	1	2	2				4	2					5	3		DA	DA	DA	DA
3*	Does your property contain rice fields?	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				1	1					1	1		DA	DA	DA	DA
4	Are these rice fields designated King's grant, State's grant, Proprietary grant, or none of them?	4	1	4	1	1	2	2	4	4	2	4	2	2	2	1	4				4	2					2	4		DA	DA	DA	DA
5	How many acres of land, including uplands, do you own on the particular tract containing the rice fields?				5	5	5	5	3	3	5	3	5			4	2				5	2					5	5		DA	DA	DA	DA
6	Approximately how many acres of rice fields do you own?	1	2	2	2	3	2	5	2	2	1	1	2			2	1				5	5					4	3		DA	DA	DA	DA
7*	How are you taxed for your rice fields?	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3				3	3					3	3		DA	DA	DA	DA
8	Are your rice fields utilized in any way?	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1				2	1					1	1		DA	DA	DA	DA
9	How are your rice fields utilized?	12	1	12	4	23	12	23	7	13	6	2	2	23	7	2	14				7	2					123	23		DA	DA	DA	DA
10	Who utilizes your rice fields?	1	5	5	3	5	1	1	7	3	6	1	5	1	7	1	1				7	1					26	12		DA	DA	DA	DA
11	Do you charge for the use of these rice fields?	2	2	1	2	2	2	2	2	2	1	2	2	2	2	2	2				2	2					1	1		DA	DA	DA	DA
12	Are your fields open to the public?	2	1	1	1	1	1	1	1	1	2	2	1	2	1	2	1				1	1					1	2		DA	DA	DA	DA
13	Do you have control over the public use of the fields?	1	1	1	2	2		2	1	1	1	1	1	1	2	1	2				2	2					12	1		DA	DA	DA	DA
14*	What are the values of the rice fields to you?																													DA	DA	DA	DA
15	Do you currently practice any type of management or conservation on the rice fields of your land?	1	2	1	1	1	2	1	2	1	2	1	1	1	2	1	1				2	1					1	1		DA	DA	DA	DA
16	Which type of rice fields do you manage?	2	4	3	1	3	4	3		1	2	2	2	2	4	2	1					2					2	2		DA	DA	DA	DA
17	What type of management do you practice?	4	5	4	3	4	5	4	5	3	5	4	4	4	5	4	1				2	13					4	1		DA	DA	DA	DA
18*	Do you have a current written/specific plan of management?	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2				2	2					2	2		DA	DA	DA	DA
19*	Were you assisted with this management plan?	2	2	1	2	2	2	2		2	2	2	1	2	2	2	2				2	2					2	2		DA	DA	DA	DA

Original culmination of answers by landowner. Landowner names are omitted.

** Denotes questions a priori deleted from field of questions.*

APPENDIX A
Culmination of Responses

QUESTIONS		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
20*	If, yes, who were you assisted by?	5	5	1	5	5	5	5		5	5	5	3	5	5	5	5				5	5					5	5		DA	DA	DA	DA	
21	How is the management paid for?	2		6	5	2		2		1	DA	2	2	2		2	2				2	2						3	3		DA	DA	DA	DA
	Are you involved with any																																	
22	conservation?	1	2	1	1	1	2	1	2	1	2	2	1	1	2	2	2				4	1					1	2		DA	DA	DA	DA	
	Are there any easements or land																																	
23	grants given of your rice fields?	3	1	1	2	13	3	3	3	4	1	4	4	4	2	4	2				4	1						1	2		DA	DA	DA	DA
	How much annually do you spend on																																	
24	management of any sort on the rice																																	
	fields?	2	1	2	1	2	0	4	0	1	1		2	4	1	4	1				0	2							1		DA	DA	DA	DA
	If you could do anything you wanted																																	
25*	with your fields, what would that be?																				DA										DA	DA	DA	DA
	Who regulates your activities on the																																	
26*	rice fields?																				DA										DA	DA	DA	DA
	Can you do what you want with the																																	
27	rice fields?	2	2	2	2	2	2	2	2	2	2	1	2	1	2	1	2				DA	2						2	1		DA	DA	DA	DA
	If no, have your limited options kept																																	
	you from actively managing your																																	
	fields in the ways that you would																																	
28	have liked?	2	2	1	1	1	1	1	1	2	2	DA	1	DA	2	DA	1				DA	1						3			DA	DA	DA	DA
29*	Who is limiting your options?															DA					DA										DA	DA	DA	DA
30*	Why are "they" limiting your options?															DA					DA										DA	DA	DA	DA
	How are "they" limiting your																																	
31*	options?															DA					DA										DA	DA	DA	DA
	Do you think that regulations should																																	
	be loosened or tightened concerning																																	
	the preservation and conservation of																																	
32	the rice fields?	1	1	1	1	1	1	1	1	3	3	1	1	1	1	3	1				DA	3						3	3		DA	DA	DA	DA
	Can you foresee cooperative action																																	
	between private landowners and the																																	
	regulatory agencies as far as the																																	
	conservation and preservation of the																																	
33*	rice fields is concerned?	1	1	1	1	1	2	2	2	1	1	1	1	3	1	2	2				DA	1						1	2		DA	DA	DA	DA

Original culmination of answers by landowner. Landowner names are omitted.

* Denotes questions a priori deleted from field of questions.

APPENDIX A
Culmination of Responses

QUESTIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
34 Would you be interested in more cooperative actions should it be determined that the regulatory agencies, the public and the private landowners could agree on management and benefits to all parties?	1	1	1	1	3	2	1	2	1	1	2	2	2	1	2	1				DA	1					1	2		DA	DA	DA	DA
35 If rediking were possible, would you consider it?	DA	1	1	1	1	1	1	1	1		DA	1	2	1	DA	1				DA	1					1			DA	DA	DA	DA
36 Would you be interested in a cooperative management program with the state and some degree of public access if you could redike?	DA	1	2	1	1	2	1	2	2	1	DA	2	2	2	2	1				DA	1					1			DA	DA	DA	DA
37 Have you noticed any wildlife/economic/ecological/recreational changed in the rice fields and the surrounding river over the time that you have owned your land?	1	1	1	1	1	1	1	1	2	2	DA	2	1	1	1	1				DA	1					1	1		DA	DA	DA	DA
38 What is the one thing you would like to change about any aspect of anything concerning the rice fields? If a management plan were devised that was based on a broad view of what the Cooper River Drainage Basin needs to maintain its quality, would you accept limitations on what you could do with your fields for the benefit of the basin?	7	8	8	8	7	13	8	1	8		NC	8	1		2	7				DA	8								DA	DA	DA	DA
39	1	1	1	1	3	1	1	2	3	1	2	2	2	1	1	1				DA	1					1	2		DA	DA	DA	DA

Original culmination of answers by landowner. Landowner names are omitted.

⊙ Denotes questions a priori deleted from field of questions.